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*O. Lusitanicum*, Sardinia and Island of Madeira.

*O. palmatum*, Eastern Cuba.

*O. pendulum*, Oahu, Hawaiian Islands.

A note accompanies the latter to the effect that it was collected on trees, which is quite strong evidence of the probable necessity for the presence of this symbiont.

It thus appears that in the Ophioglossaceæ throughout the world, there exists a close symbiotic relationship with this organism, in all probability an accompaniment, or the cause of, the absence of root-hairs, which may have disappeared through lack of the necessity for such absorbent organs.

No specimens of *Helminthostachys* were at hand to examine, but I think we may confidently expect to find the organism in this genus also.

It may still be a question how much influence this symbiont has had on the simplicity of structure found in the Ophioglossaceæ, and what effect this would then have on the phylogenetic position of the order.

BOTANICAL DEPARTMENT, CORNELL UNIVERSITY.

### Photography as an Instrument for recording the macroscopic Characters of Micro-organisms in artificial Cultures.\*

BY GEO. F. ATKINSON.

Many species of micro-organisms in artificial nutrient media present, in the growth of the colonies, characteristic peculiarities of form. These macroscopic appearances are frequently of great value when employed as differential characters. Some species, especially of fungi, when viewed by transmitted light, present important characters in the fine radiating threads and the general arrangement of the colony as a whole. The comparative density also of the colony is frequently quite constant.

A method of accurately recording these macroscopic characters would be a valuable aid in descriptions and comparative study.

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\* Read before the Section of Botany, A. A. S., Madison Meeting, August, 1893.

Where the growth is colorless, not very dense and peculiar for the fineness of its meshes or radiations, it would be difficult to photograph the colonies by ordinary methods of exposure, since there is little difference in color between the medium and the object.

A sensitive plate in an ordinary camera exposed to a plate culture by perpendicular rays of transmitted light shows little differentiation between the medium and colonies after development. The differentiation is also weak in the ground glass.

When, however, the perpendicular rays of light are cut off, and oblique rays from several directions are thrown through the plate culture upon the sensitive plate, the colonies are differentiated strongly in all their exquisite forms and tracings. The culture plates (Petrie dishes) or tubes, are inserted in an opening in the end of a box, which is painted perfectly black on the inside. Sliding boards, in a grooved frame, each cut to clamp over half the Petrie dish and lined with black velvety stuff hold the plate culture in position. The lens of the camera is pointed toward a window with the plate culture between. A perfectly black screen, 30 cm. to 40 cm. in diameter is then hung upon the window directly in front of the object in order to cut off the perpendicular rays of light.

BOTANICAL DEPARTMENT, CORNELL UNIVERSITY.

### Crossing of Cucurbits.\*

By L. H. PAMMEL.

So widespread is the popular belief that several members of the genera *Cucurbita*, *Cucumis* and *Citrullus* will hybridize and "mix," that it is difficult to convince people of these errors. What is more surprising is that these opinions should find support among a certain class of popular scientists. It is scarcely necessary to repeat experiments of this kind, after the diligent work of Naudin, Bailey, Munson and others who have all demonstrated

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\* Read by title before the Section of Botany, A. A. A. S., Madison Meeting, August, 1893.